likewise seeks to import into the general process of chemical action the conceptions of dynamics. The simple words with which he concludes his paper sound somewhat archaic to-day, but fifty-four years ago they must have startled the members of Section B. "In using the atomic theory, chemists have added to it of late years an unsafe, and as I think, an unwarrantable hypothesis, namely that the atoms are in a state of rest. Now this hypothesis I discard, and reason upon the broader basis of atomic motion."

Williamson was not a prolific writer, and his fame mainly rests upon his work of this period and upon what he achieved during the first ten years of his professorial activity. He published comparatively little between 1854 and 1864, but under the stimulus of the new movement, he took an active part in the formulation of what is still current doctrine, and produced a series of papers on the principles of chemical classification, valency, and nomenclature which exercised a powerful influence on chemical teaching in this country.

Williamson was elected into the Royal Society in 1855, and served on the council from 1859 to 1861, again from 1869 to 1871, and for a third time from 1873 to 1890, during which period he acted, as already stated, as foreign secretary. In 1889–1890 he was made a vice-president. In 1862 he received a Royal medal. He was twice president of the Chemical Society—viz., in 1863–65 and again in 1869–71, and was one of the six presidents who had been fellows of the Society for upwards of half a century who were present at the memorable banquet in 1898. He was largely instrumental in establishing the present series of abstracts of foreign chemical literature which form so valuable a feature of the *Journal* of the Chemical Society.

In 1873 he was president of the British Association. His merits as a man of science received wide-spread recognition. He was an honorary graduate of Dublin, Edinburgh, and Durham, a member of the Institute of France and of the Berlin Academy, and of many scientific societies on the Continent and in America.

T. E. THORPE.

ÉMILE DUCLAUX.

IN the death of Émile Duclaux science has lost one of her most devoted and brilliant workers. His career has formed the principal link between the bacteriology of the present day, and what may be called the heroic period in the history of micro-biology which followed on the unveiling, by the genius of Pasteur, of the secret of fermentation, and the consequent opening out of avenues through which innumerable problems could be successfully attacked.

The Pasteur Institute will in particular mourn its loss, for, owing to the charm of his personality and the extraordinary catholicity of his scientific enthusiasms, he was a worthy successor to the great leader, and the continuance of that brotherliness which was such a striking feature among the little community of scientific investigators in the Rue Dutot must in considerable measure be attributed to his influence.

Duclaux was born at Aurillac, on June 24, 1840. He was not a son of fortune, and it was only by dint of hard struggle and a determination which was capable of much self-denial that he succeeded in becoming a *Normalien* in 1859. At the Ecole Normale he studied principally chemistry and physics, and left the school as *Agrégé* in 1862.

At that time Pasteur, who had returned to the Ecole Normale as director of scientific studies, had recently established the positions of Agrégés préparateurs, whereby an able and earnest young graduate might remain for a few years as a research-assistant to one of his masters.

For some three years Duclaux remained préparateur to Pasteur, and was his first lieutenant during the celebrated investigations into the causes of diseases in wine and into the silkworm disease, which had nearly ruined some of the Departments of France.

In 1865 he became Docteur ès Sciences, presenting a thesis upon fractional distillation. In the same year he was appointed a professor at the *lycée* in Tours, and during the following year became acting professor of chemistry at Clermont. It was at Clermont that Pasteur stayed with Duclaux during the troublous times of the war, and it was here that the intimacy and affection which ceased only at the death of Pasteur was established between them. It was at Clermont, also, that he numbered among his students Roux, whom he introduced to Pasteur.

From Clermont, Duclaux went to Lyons as professor of physics, where he remained until he accepted, in 1878, the chair of physics and meteorology at the Institute Agronomique in Paris. In 1886 he became professor of biological chemistry at the Sorbonne, which position he held until his death. When the Pasteur Institute was completed, he transferred his classes to the Rue Dutot. At the death of Pasteur, Duclaux was elected to succeed him as director, and for the last nine years the great work of the Institute has been developed under his guidance. He, however, has not taken any direct part in that portion of its activities dealing with infective diseases, but has confined himself more particularly to the chemical and industrial side of microbiology.

When one considers the scientific work of Duclaux, the first and most striking point is the wide range of subjects it includes. Trained as a chemist and physicist, he has occupied chairs in both these subjects, and has published a not inconsiderable number of original researches in the domains of pure chemistry and physics. At the same time his most important work was biological. Like Pasteur, he was a chemist who worked at biology, but principally at that department of biology dealing with the physiology of micro-organisms and the chemistry of enzymes, and he brought his training in the exact sciences to bear upon investigations of a biological character, with the greatest success.

The list of his original contributions to scientific journals contains upwards of eighty papers, and includes papers on molecular physics, chemistry, meteorology, physiology of digestion, enzymes, vegetable physiology, bacteriology, and technological papers on milk, butter, wine, sericulture; and he is also the author of several books. In "Ferments et Maladie" and "Le Microbe et la Maladie" he gave popular expositions of the results achieved by the Pasteurian method, and the complete change thereby produced in the standpoint from which infectious diseases were regarded.

In 1896, Duclaux published his "Pasteur, Histoire d'un Esprit," which deals with the researches of the great master from first to last, pointing out the condition of knowledge on the various subjects before Pasteur had brought them, one by one, under the influence of his imagination and accurate experimentation. This forms one of the most brilliant descriptions of the operation of scientific method in unravelling the relationship of phenomena; its perusal might well form a portion of the education of every student of science.

The most important of Duclaux's published books is the "Traité de Microbiologie"—the four volumes of which appeared during the years 1898 to 1901—each chapter of which bears the stamp of the author's individuality, and contains many original observations not

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published elsewhere. "L'Hygiène sociale" embodies a series of lectures given at the École des hautes Études sociales, in which he points out forcibly that the development of our knowledge regarding the causation of disease has devolved upon us new responsibiliities as individual citizens, and in which he advocates an intelligent propagandism rather than legal insistence.

On one occasion Duclaux felt himself constrained to leave the peaceful search after truth which he had been pursuing all his life in his laboratories, and to enter upon the turmoil of the public platform. This was on the occasion of the Dreyfus case, when, thinking the cause of truth was imperilled, he, with complete disregard of all personal considerations, and, as it happened, with most disastrous consequences to his health, threw himself into that fierce struggle with invincible ardour. He, with Zola, Grimaux, and some other *intellectuels,* founded the Ligue des Droits de l'Homme, and it was whilst addressing a meeting of this League that he was seized with an attack of apoplexy. He made a slow recovery, and regained sufficient health to resume his work at the Institute, but has now succumbed to a second seizure from which he never regained consciousness.

Owing to the versatility of his genius and the wide field of scientific subjects which occupied his attention during a very active life, it is difficult to form an adequate estimate of the importance of his scientific work. It will be, perhaps, on account of his researches into the ferments and the chemical processes associated with the life and activities of micro-organisms that he will be best remembered by the world of science; but for those who have had the privilege of being his pupils and associates it will be the memory of the kindly guide and critic, whose enthusiasm was a continual spur to effort, and whose ideas were ungrudgingly at the disposal of every disinterested inquirer into truth, that will remain for ever foremost. CHARLES J. MARTIN.

SIR H. M. STANLEY.

THE death of Sir H. M. Stanley on Tuesday, at sixty-three years of age, deprives the world of a man of action, and geography of one of its greatest pioneer explorers. It can truly be said that he changed the map of Africa by the results of his expeditions, and his picturesque narratives created public interest in the problems of African exploration.

Stanley's adventures in Central Africa while engaged in the search for Livingstone attracted great attention, and his famous book, "How I Found Livingstone," in which the expedition is described, has become a classic work of travel. Commissioned to find Livingstone, of whom nothing had been heard for two years, Stanley reached Zanzibar in January, 1871, and on November 10 of the same year met the explorer at Ujiji, on Lake Tanganyika, where Livingstone had just arrived from Nyangwe. The two travellers explored together the north end of Tanganyika, and proved conclusively that the river Rusizi flowed into and not out of the lake, and that Tanganyika had no connection with the Nile system. In February, 1872, Livingstone started on the journey from which he never returned, and Stanley made his way back to Europe.

In 1874, Stanley left England for the expedition to Central Africa which has immortalised him. The writer of the obituary notice in the *Times,* from which some of the particulars here given have been derived, points out that little more than the position of Victoria Nyanza was then known; its shape was all wrong; our knowledge of Albert Nyanza was incomplete; Lake Tanganyika was imperfectly defined; and nothing was known of the region that lies between Lakes Albert and Tanganyika. Stanley's expedition changed all that. He proceeded from Bagamoyo west and north to Victoria Nyanza, tracing a river which he believed (erroneously, we now know) was the remote source of the Nile. He circumnavigated the lake, and for the first time proved to satisfaction that it was one great lake and not a group of small lakes, and that its shape was very different from that laid down in Livingstone's map. Westwards to Muta Nzige, as Lake Albert is called by the natives, Stanley and his great following marched. They struck a bay (Beatrice Gulf), which is now recognised as part of a southern lake, afterwards named by Stanley Lake Albert Edward. Important rectifications and additions were made in the country lying between Victoria Nyanza and the lakes to the west, and thence south to Ujiji. Stanley circumnavigated Tanganyika, rectifying its contour, and proving conclusively that the lake had an outlet in the river Lukuga.

Leaving Nyangwe in November, 1876, Stanley reached Boma, near the mouth of the Congo, in August, 1877. This journey across Africa lasted two years and nine months. The results to geography were certainly immense; it is doubtful if on any other single expedition so much had been done to fill up the great blank in the map of Africa. The narrative of this expedition was given by Stanley in "Through the Dark Continent."

The magnitude of Stanley's discovery we are only now realising, when the multitude of mighty tributaries north and south are being opened up, and we are able to form an estimate of the vast basin of the Congo.

Stanley had scarcely landed in Europe, in 1878, when the King of the Belgians solicited his aid in the opening up of the Congo. In the following year he returned to the Congo; and this was the beginning of what really soon became the Congo Free State, under the sovereignty of the King of the Belgians.

In 1887, Stanley went again to Africa—this time in search of Emin Pasha. Emin was found, but the expedition met with several disasters. Finally, marching through new country, exploring the Semliki River, Mount Ruwenzori, and Lake Albert Edward, Stanley and his followers made their way by the south of the Victoria Nyanza to the coast, he reaching Zanzibar on December 6, 1888, leaving Emin behind on the mainland.

On this expedition Stanley succeeded in solving some important problems in the hydrography of Africa and adding much to our knowledge of its geography. Among the geographical results were the discovery of the Semliki River, which issues from Lake Albert Edward and enters the south end of Lake Albert Nyanza, the Ruwenzori range between these two lakes, and the south-western extension of Lake Victoria. The results of this expedition are described in the volume "In Darkest Africa."

Stanley has been termed "the Bismark of African exploration," and in many respects the comparison is not inappropriate; for the work he accomplished united into one great whole the *disjecta membra* of African exploration, and it was carried out with firm nerve and unflinching will.

INTERNATIONAL ASSOCIATION OF ACADEMIES.

THE following is a list of the delegates who, according to the latest advices, will attend the General Assembly of the International Association of Academies, to be held at the Royal Society's Rooms at Whitsuntide:—

Amsterdam.—Koninklijke Akademie van Wetenschappen, Prof. H. G. van de Sande Bakhuyzen and Prof. M. J. de Goeje. *Berlin.*—Kgl. Preussische Akademie der Wissenschaften, Prof. H. Diels, Prof. W. Waldeyer, Prof. W. von Bezold and Prof. R. Pischel. *Brussels.*—Académie

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